

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-521
FACULTY OF SCIENCE AND TECHNOLOGY
T.E. (MECHANICAL)
Design Of Machine Elements -I
(REVISED)

[Time: Three Hours]

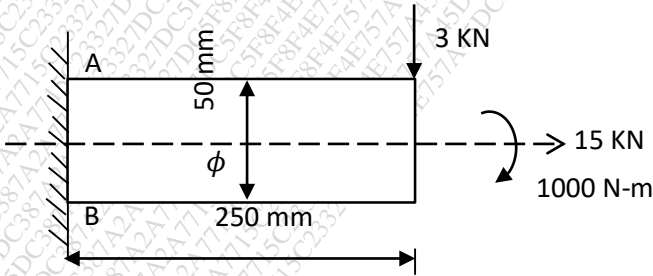
[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

1. Q.No.1 and Q.No.6 are compulsory.
2. Solve any two questions from remaining in each section.
3. Assume suitable data if necessary.

Section A

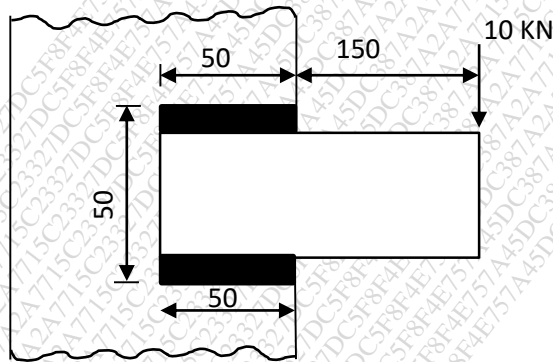
- Q.1 Solve any five: 10
- i) Define machine design and classify.
 - ii) Define ergonomics
 - iii) What is preferred series?
 - iv) Draw stress-strain diagram.
 - v) Explain mechanical advantage of lever.
 - vi) Why hexagonal head is preferred for cap screw?
- Q.2 A shaft, as shown in fig is subjected to a bending load of 3 KN, pure torque of 1000 N-M and an axial pulling force of 15 KN. Calculate the stresses at A and B. 15
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- Q.3 Design a knuckle joint to transmit 150 KN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression. Draw neat sketch and specify major dimensions. 15
- Q.4 Design a muff coupling to connect two shafts transmitting 25 KW power at 360 rpm. Shaft and key are made of plain carbon steel 3008 having yield strength 400 N/mm² in tensile and compression. Sleeve is made of grey cast iron FG200 having ultimate tensile strength 200 N/mm² factor of safety for shaft and key is 4 and for sleeve is 6. 15
- Q.5 A vertical two start square threaded screw of a 100 mm mean diameter and 20 mm pitch supports a vertical load of 18 KN. The axial thrust on the screw is taken by a collar bearing of 250mm outside diameter and 100 mm inside diameter. Find force required at the end of a lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for the vertical screw and nut is 0.15 and that for collar bearing is 0.20. 15

Section B

- Q.6 Solve any five: 10
- i) What is stress concentration?
 - ii) Explain fatigue failure?
 - iii) Explain throat and leg of weld.
 - iv) Enlist types of failure in riveted joint.
 - v) Define stiffness of spring.
 - vi) Give significance of Wahl factor.

Q.7 A circular bar of 500 mm length is supported freely at its two ends it is acted upon by a central concentrated cyclic load having a minimum value of 20 KN and a maximum value of 50 KN. Determine the diameter of bar by using a factor of safety of 1.5 size effect of 0.85, surface finish factor of 0.9. The material properties of the bar are given by –ultimate strength of 650 MPa, yield strength of 500 MPa and endurance strength of 350 MPa. 15

Q.8 A welded connection of steel plates, as shown in fig is subjected to an eccentric force of 10KN. Determine the throat dimension of the Wolds, if the permissible shear stress is limited to 95 N/mm². Assume static conditions. 15



Q.9 It is required to design a helical compression spring subjected to a maximum force of 1250 N. the deflection of the spring corresponding to maximum force should be approximately 30 mm. the spring index can be taken as 6. The spring is made of patented and cold drawn steel wire. The ultimate tensile strength and modulus of rigidity of spring material are 1090 and 81370 N/mm² respectively. The permissible shear stress for spring wire should be taken as 50% of ultimate tensile strength. Design the spring and calculate Dimⁿ 15

- i) Wire dia
- ii) mean coil dia
- iii) Active coils
- iv) Free length
- v) Pitch

Q.10 Derive the equation for Nipping of leaf spring. 15